Ni-Fe Battery

Operation and Maintenance

IRON EDISON

Application

The Iron Edison nickel-iron (Ni-Fe) rechargeable batteries are designed to store DC power in off-grid, UPS, or other renewable energy systems.

Optimal temperature range is -20°C ~ +50°C or -4°F ~ +114°F.

Features and Performance

1.1 The active materials of the pocket plate battery are retained in pockets formed from steel strips double perforated by a patented process.

These pockets are mechanically linked together, cut to the size corresponding to the plate width and compressed to the final plate dimension. This process leads to a plate which is not only mechanically very strong but also retains its active material within a steel containment which promotes conductivity and minimizes electrode swelling.

These plates are then welded to a current carrying bus bar assembly which further ensures the mechanical and electrical stability of the product.

1.2 Voltage: The cell voltage of nickel-cadmium cells results from the electrochemical potentials of the nickel and the iron active materials in the presence of the potassium hydroxide electrolyte. The nominal voltage for this electrochemical couple is 1.2 volts.

1.3 Capacity: The real capacity of the rechargeable battery is bigger than the nominal capacity. Example: TN350 rechargeable batteries' real capacity should be more than 350 Ah.

1.4 Cycle Life: The battery system has an initial life of 750-1000 charge and discharge cycles with the supplied electrolyte. During the life of the battery, the discharge capacity should not be less than nominal capacity. The minimum discharge capacity should be more than 90% of the nominal capacity.

1.5 Storage period: Rechargeable battery can keep the life time performance after storage for 4 years under the required storage conditions. If new battery were stored over 4 years, please carry out 3 to 5 charge and discharge cycles before capacity inspection. If the capacity can reach the nominal capacity and no rustiness, the battery can be put in use.

1.6 Charge / Discharge: The battery can be over charged and over-discharged. They also can be discharged with the current of 1ItA. But it is inadvisable for the battery to be discharged with the current of 1ItA over 30 min.

1.7 Temperature: If the operating temperature is less than -20°C or -4°F, the discharge capacity of the battery will be significantly reduced. Keep the battery in a conditioned environment.

2. Operation and Maintenance

2.1 Preparation of electrolyte (see table 1)

Table 1

No.	Operation temperature	Gravity	Electrolyte dry powder	Weight ratio (Dry powder : Water)
1	+31℃ ~ +45℃	1.18±0.02	KOH+20 g/L ($LiOH.H_2O$)	1 : 5
2	-10℃ ~ +30℃	1.20±0.02	KOH+40 g/L ($LiOH.H_2O$)	1 : 3
3	-25℃ ~ -11℃	1.25±0.02	KOH	1 : 2

Ensure that the mixing vessel is clean (if not brand new) and that it can contain the total quantity of liquid you plan on mixing.

Use only distilled water for mixing electrolyte.

CAUTION: Always add flake electrolyte to the water, and never add water to the flake electrolyte. Only dissolve a small amount of flake electrolyte at a time.

Please dissolve the LiOH into the distilled water in a separate vessel. Then combine the LiOH solution with the KOH solution.

In the No. 3 electrolyte mix, the KOH powder should not contain more than 4% potassium carbonate. Never use electrolyte that contains NaOH.

IMPORTANT: Do not mix electrolyte in copper, aluminum or galvanized steel containers. Be aware that welding seams may be made of these metals.

The person mixing the electrolyte must wear safety goggles, pants, boots, long sleeves, protective gloves and protective apron.

In case of contact of any of the referred materials (either is solid components or liquid electrolyte), flush with clean water.

In case eyes have been affected, immediately flush eyes with copious quantities of fresh clean water. Then seek immediate medical attention.

Technical requirements of the water for preparing electrolyte

No.	Item	Standard
1	Physical specification	Achromatic color、unpalatable、transparent、No impurity
2	Resistance (Ω)	≥200000
3	Fe (g/L)	≤0.00005
4	$SO4^{2-}$ (g/L)	≤0.0005
5	Cl- (g/L)	≤0.001
6	Heavy Metal Pb (g/L)	≤0.00005
7	Ca 、Mg Mg (g/L)	≤0.0006
8	SiO_3^{2-} (g/L)	≤0.0001

2.2 Storage of electrolyte

The electrolyte should be stored in the sealed alkali resistance container.

2.3 Temperature Range

Please choose the property electrolyte according to the operation temperature.

2.4 Charge and discharge

Charge methods (See table 3)

Table 3

Charge type Condition	Normal Charge	Over Charge	Fast Charge
Current	0.25I.A	0.25 I.A	0.5 I.A
Time	8hrs	12 hrs	4 hrs

Discharge methods (See table 4)

Table 4

Discharge Rate	End voltage (V)	Time (h)	Remark
$1I_t$	≥0.5	Approximate 1h	
$0.5I_t$	≥0.7	Approximate 2h	
$0.33I_t$	≥0.9	Approximate 3h	
$0.2I_t$	≥1.0	Approximate 5h	
$0.125I_t$	≥1.10	Approximate 8h	
$0.1I_t$	≥1.10	Approximate 10h	
$0.05I_t$	≥1.15	Approximate 20h	

3. Operating Instructions

3.1 The Ni-Fe rechargeable battery was charged and discharged before leaving factory. Since the battery is delivered dry, it should be filled with mixed liquid electrolyte before use. The electrolyte level must be 15~30mm higher than the top of electrodes group.

Before operation, the battery shall be charged according to the over-charge method for one cycle. If the battery was stored more than one year or the electrolyte has been renewed, carry out 2~3 cycles of charge and discharge.

3.2 During daily operation, the battery shall be charged and discharged according to the normal charge and discharge method. If necessary, the battery can be fast charged.

3.3 The electrolyte will absorb the carbon dioxide in the air and create carbonate easily during operation. When carbonate in the electrolyte is over 50g/L, the performance of the battery will be negatively affected. After 150~200 cycles or 1 year, please check the carbonate in the electrolyte. If the carbonate in the electrolyte is over 50g/L, please replace the electrolyte.

3.4 Do not operate the Ni-Fe battery together with a Lead Acid battery.

3.4 Trouble Shooting

Trouble	Causes	Replace the electrolyte.
The capacity of the battery decreases	1.The electrolyte has been used of a long time and the carbonate content in it is too high.	Replace the electrolyte.
	2.The electrolyte is improperly used.	Replace the electrolyte.
	3.The electrolyte isn't enough, and the level of the electrolyte is below the top of the plates.	Add distilled water, and adjust the density, then overcharge it.
	4.Hurmful impurities contained in the electrolyte is too high.	Replace the electrolyte after cleaning.
	5.The charge/discharge mechanism isn't correct.	Use the correct charge/ discharge mechanism.
	6.Short-circuit or slight-short circuit in the cell	Replace the short-circuit cell.
	7.Short-circuit or slight-short circuit occurs out of the cell	Keep the cells in a dry temperature.
	8.The instruments used is not correct.	Check and rectify the galvanometer and voltmeter.
Voltage is Un-correct.	1.The inner circuit of the cell is short or cut, the electrolyte has been run out.	Clean the cell, or change the electrolyte.
	2.The out circuit of the battery is short or cut.	Keep the cell dry, and check.
	3. Contact fault.	Check and repair.
The cell container swells	1.The positive plate swells.	If necessary, change the cell.
	2.The vent is blocked up.	Clean with hot water or replace it.
	3.The inner circuit of cell is short, or there are too many impurities in the electrolyte.	Check and replace the electrolyte.
Bubbles appear in the inside of the cell	The electrolyte contains organic impurities.	Replace the electrolyte.
Creeping of electrolyte	1. The level of electrolyte is too high.	Drain out the superfluous electrolyte.
	2. The vent of terminal is unsealed.	Replace the sealing parts and screw tightly.
	3.electrolyte overflow	Clean and keep dry.

Cell Types	Nominal voltage (V)	Nominal capacity (Ah)	Max. External Dimension (mm)			Pole size	Dry Weight (Kg)	Material of cell case
			L	W	H			
TN10-(2)	1.2	10	38	84	135	M6	0.8	
TN20-(2)	1.2	20	32	113	223	M6	1.2	
TN30-(2)	1.2	30	68	134	245	M10×1	2.5	PP
TN40-(2)	1.2	40	68	134	245	M10×1	2.5	
TN45-(2)	1.2	45	68	134	245	M10×1	2.5	
TN50-(2)	1.2	50	70	134	285	M16	2.9	
TN60-(2)	1.2	60	70	134	285	M16	3.4	
TN80-(2)	1.2	80	80	141	370	M10×1	4.0	
TN100-(2)	1.2	100	80	141	370	M10×1	5.0	
TN150-(2)	1.2	150	106	164	345	M20	7.0	
TN200-(2)	1.2	200	106	164	345	M20	8.5	
TN250-(2)	1.2	250	138	276	420	M16	13.5	
TN400-(2)	1.2	400	138	276	450	M16	19.0	
TN600-(2)	1.2	600	176	291	510	M20	28.0	
TN700-(2)	1.2	700	176	291	510	M20	30.0	
TN800-(2)	1.2	800	186	398	570	M20	40.0	
TN1000-(2)	1.2	1000	186	398	570	M20	45.0	

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